

A workflow system for document image analysis

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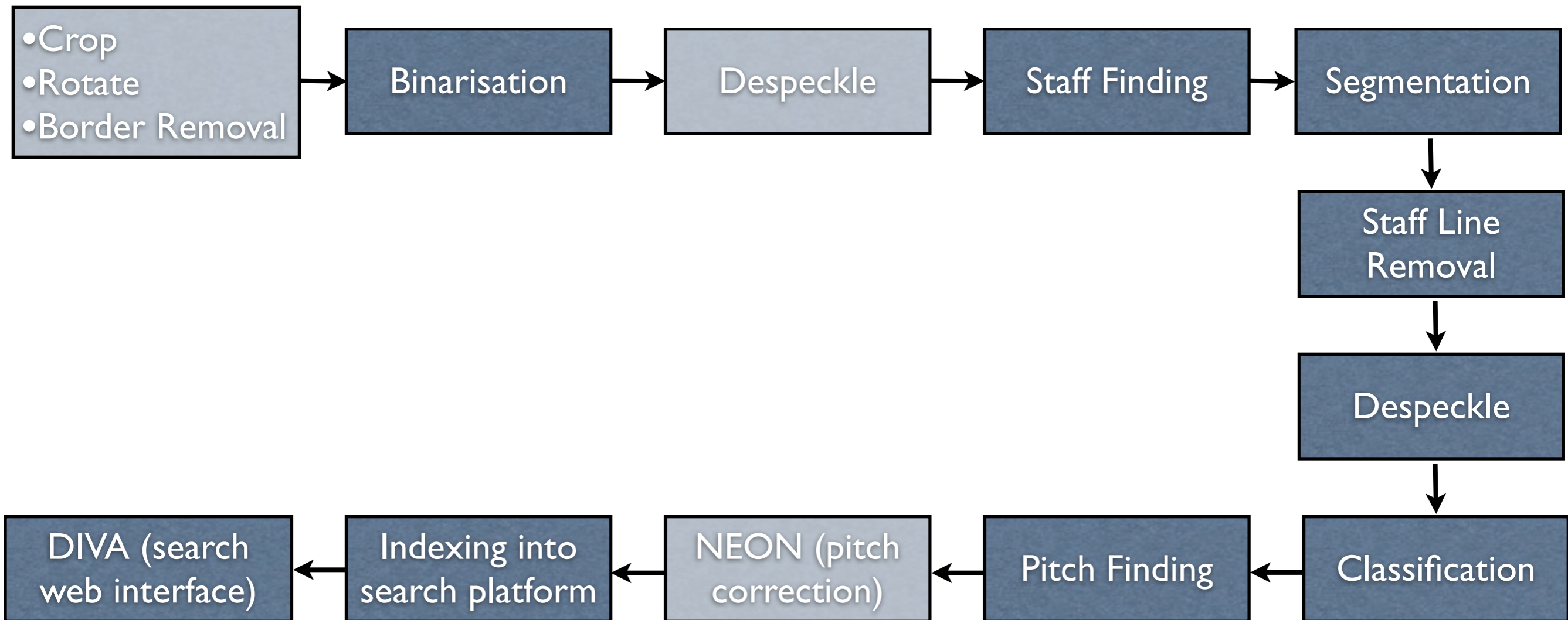
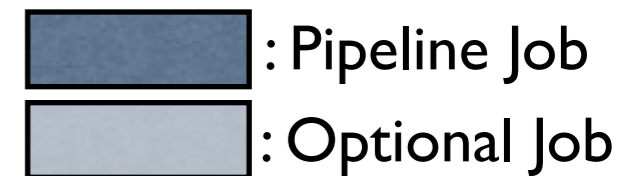
Introduction

- Creating digital musical data from images involves many interdependent steps
- Some steps performed automatically by the computer
- Others require human intervention
- Need for an ordering of steps

Workflow System

- Sequence of connected steps
- Units/Steps of execution which we refer to as “jobs”
- Two types of jobs:
 - Pipeline Jobs (e.g. Staff Finding)
 - Optional Jobs (e.g. Rotate)

Workflow System



Workflow Job Execution

- User creates a workflow
 - Chooses jobs for the workflow
- Web page with all the manual jobs and currently executing job
 - User works on “manual” job
 - Submits job for execution and awaits results
- Automatic jobs are submitted for execution automatically
- User goes through this process until completion

Workflow Job Execution - Adding jobs to workflow

The screenshot displays the Rodan web interface. At the top, there is a navigation bar with the Rodan logo, 'Dashboard', 'Create project', and 'Log out (demo)'. Below this is a search bar for projects. The main content area is titled 'Add jobs to workflow Sample Workflow' and features a central image of a manuscript page with musical notation. To the right of the image, there are two sections: 'Workflow jobs' and 'Available jobs'. The 'Workflow jobs' section contains four jobs: 'Crop', 'Binarise (simple threshold)', 'Staff finding', and 'Segmentation'. The 'Available jobs' section contains one job: 'Staff removal'. A button at the bottom right says 'I'm done, start the jobs'. On the left side, there is a sidebar with a list of projects, each with a progress indicator showing 0%.

Search for a project...

Sample Project - loitestng.tif - Add jobs

Add jobs to workflow Sample Workflow

Workflow jobs

- Crop**
Crop an image. :: [Remove](#)
- Binarise (simple threshold)**
Convert an image to black and white (simple threshold). ::
- Staff finding**
Find stafflines in an image. ::
- Segmentation**
Separate music from other material on a page (e.g., lyrics). :: [Remove](#)

Available jobs

- Staff removal**
Remove stafflines from an image. :: [Add](#)

I'm done, start the jobs

ALL PROJECTS

- Sample Project 0%
- E-SA 5 (Salamanca) 0%
- F-Pn lat. 12601 (St. Taurin) 0%
- NL-Uu 406 (Utrecht) 0%
- PL-KKar 2 (Rkp 12) 0%
- US-Cn 24 (Italy) 0%
- I-Rv C.5 (Roma) 0%
- DK-Kk 3449 9o II (Augsburg) 0%
- DK-Kk 3449 8o I (Augsburg) 0%
- D-MZb E (Mainz) 0%

Workflow Job Execution - Manual Job List

The screenshot displays the Rodan web interface. The top navigation bar includes the Rodan logo, 'Dashboard', 'Create project', and 'Log out (demo)'. A search bar is located on the left. The main content area is titled 'Sample Project' and includes buttons for 'Edit project', 'Upload images', and 'Manage workflows'. Below this, there is a 'Do work' section with a grid of manual job options: 'Crop' (highlighted in blue), 'Segmentation', 'Rotate', 'Neon', 'Binarise (simple threshold)', 'Binarise (DJVU)', and 'Despeckle'. An arrow points to this grid. Below the 'Do work' section is the 'Status of jobs' table, which shows a 'Sample Workflow' at 0% completion. The 'Running tasks' section indicates 'No jobs are currently running.' The 'Project pages' section shows a thumbnail of a manuscript page.

ALL PROJECTS

- Sample Project (0%)
- E-SA 5 (Salamanca) (0%)
- F-Pn lat. 12601 (St. Taurin) (0%)
- NL-Lu 406 (Utrecht) (0%)
- PL-KKar 2 (Rkp 12) (0%)
- US-Cn 24 (Italy) (0%)
- I-Rv C.5 (Roma) (0%)
- DK-Kk 3449 9o II (Augsburg) (0%)
- DK-Kk 3449 8o I (Augsburg) (0%)
- D-MZb E (Mainz) (0%)
- D-MZb D (Mainz) (0%)

Sample Project [View project]

Description: This is a sample project.
Owner: demo
Number of pages: 1

Do work

Crop	Segmentation	Rotate	Neon
Binarise (simple threshold)	Binarise (DJVU)	Despeckle	

Status of jobs

Workflow	Status
Sample Workflow	0%

Running tasks

No jobs are currently running.

Project pages

Workflow Job Execution - Manual Job (crop) Interface

Rodan Dashboard Create project Log out (demo)

Sample Project » Crop

Crop on lol(testing).tiff

Crop an image.

Crop

Workflow Job Execution - Job in Queue

The screenshot displays the Rodan web interface. The top navigation bar includes the Rodan logo, 'Dashboard', 'Create project', and 'Log out (demo)'. A search bar is located on the left. The main content area is titled 'Sample Project' and includes buttons for 'Edit project', 'Upload images', and 'Manage workflows'. The 'Do work' section contains buttons for 'Crop', 'Segmentation', 'Rotate', 'Neon', 'Binarise (simple threshold)', 'Binarise (DJVU)', and 'Despeckle'. The 'Status of jobs' section shows a table with one entry: 'Sample Workflow' at 0% completion. The 'Running tasks' section is highlighted with a black box and contains a table with one entry: 'Crop' job on page 'lol/testing.tiff' with a 'Time in queue' of 6 seconds. An arrow points to this table. The 'Project pages' section shows a thumbnail of a document page.

Running tasks

Job	Page	Time in queue
Crop	lol/testing.tiff	6 seconds

Workflow Job Execution - Job Execution Completed

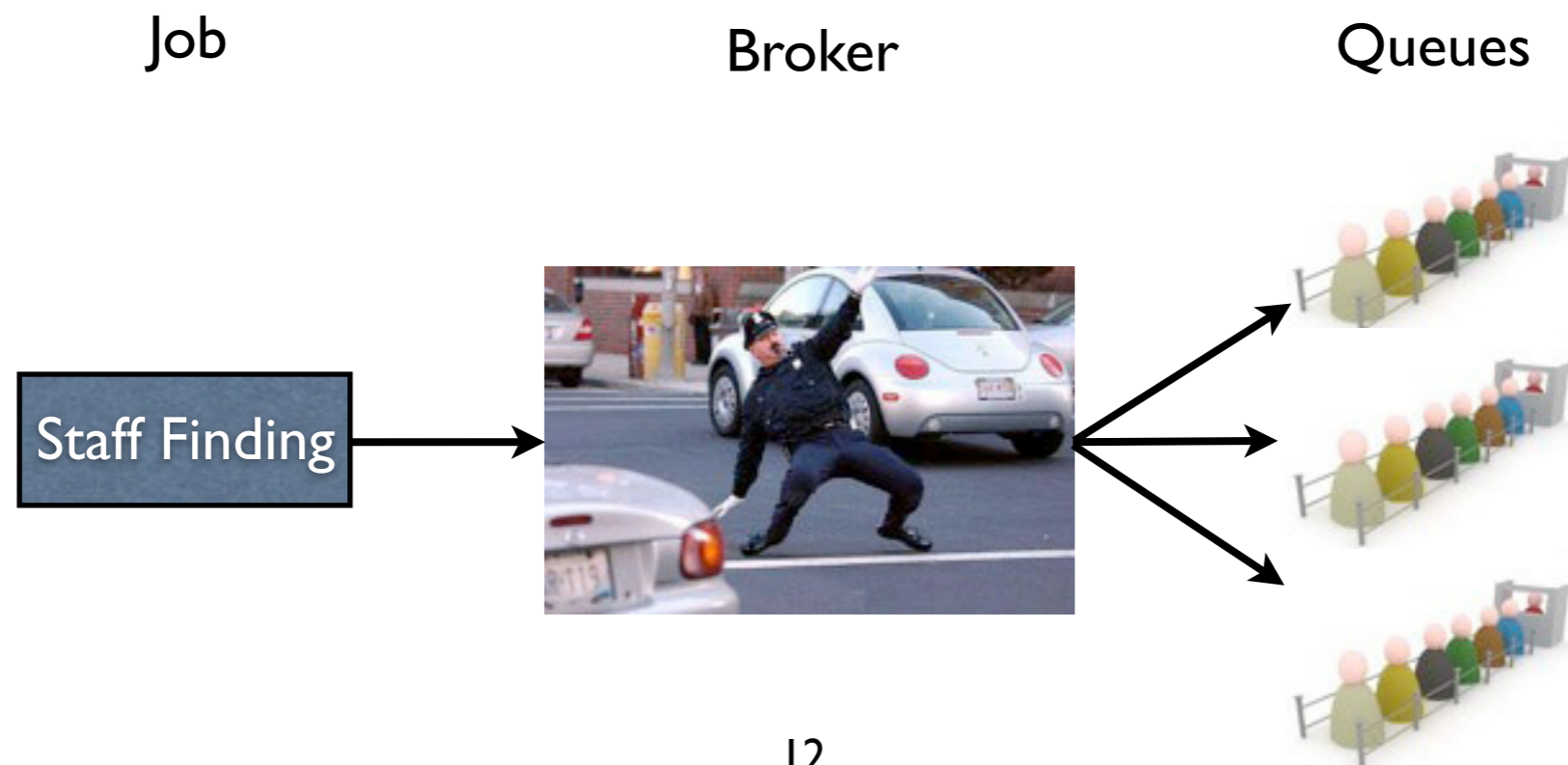
The screenshot displays the Rodan web interface. At the top, there is a navigation bar with the Rodan logo, 'Dashboard', 'Create project', and 'Log out (demo)'. Below this is a search bar for projects. The left sidebar lists 'ALL PROJECTS' with a search bar and a list of projects, each with a progress bar. The main content area shows the 'Sample Project' details, including a description, owner, and number of pages. The 'Do work' section contains buttons for various image processing tasks: Crop, Segmentation, Rotate, Neon, Binarise (simple threshold), Binarise (DJVU), and Despeckle. The 'Binarise (simple threshold)' button is highlighted with a red box and an arrow. Below this is the 'Status of jobs' section, which shows a 'Workflow' section with a 'Sample Workflow' link and a 'Status' progress bar. The 'Status' progress bar is also highlighted with a red box and an arrow, showing 25% completion. The 'Running tasks' section indicates that no jobs are currently running. The 'Project pages' section shows a thumbnail of a manuscript page.

Handling Job Requests

- Images with very high resolution and large file sizes (4400x7000, ~100MB)
- Long execution times (4s-30s)
- In order to provide a seamless user experience, need for a queue system

Queue System


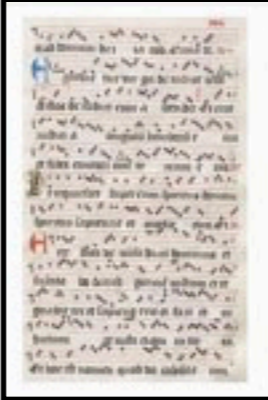

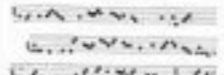
- FIFO: First In First Out
- Consists of multiple independent queues and a single job broker
- Jobs wait in their respective queues for their turn at execution



Job Results

- Access to information such as time spent in queue, time spent in manual step and image result, is available to the user for every step
- Users can view the image results and restart a particular job if they are not satisfied with the results

Workflow Job Execution - Job Results

Step	Image thumbnail	Information	Options
Original image		Image size: 92.60MB Image dimensions: 4414 x 6993	View sizes: Small :: Medium :: Large :: Original
Crop		Time in manual step: 22 seconds Time in queue 7 seconds	View sizes: Small :: Medium :: Large :: Original Restart job
Binarise (simple threshold)		Time in manual step: 14 seconds Time in queue 6 seconds	View sizes: Small :: Medium :: Large :: Original Restart job
Staff finding	This job is complete but does not output an image.	Time in queue 2 seconds	Restart job
			

Thank you

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